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Managing the Integrity of Early Pipelines
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Contractor: Battelle

The focus of this project is managing the condition of vintage pipelines such that integrity is ensured. The first three milestones have been met – an overview of the work products developed to meet these milestones follows.

The first milestone identified degradation mechanisms operative on pipelines such that integrity can be ensured by managing the threat to safety posed by this degradation. Metrics for this first milestone were the degradation mechanisms threatening integrity and their controlling factors. Threats identified within the work scope were external corrosion, internal corrosion, stress corrosion cracking, manufacturing defects, fabrication and construction defects, and third party or mechanical damage. Related degradation mechanisms included various corrosion processes, fatigue, and various forms of environmentally assisted cracking including SCC.

The second milestone involved known fabrication and construction anomalies and defects in the steel (pipe body) and the long seam. The metric for this milestone was a cross-referenced list of pipe makers (which implicitly embeds their steel suppliers) and the anomalies and defects that caused failures. Defects in the pipe body relate to how the steel was produced, and then how it was made into line pipe. Where pipe making involved a long seam, seam-related defects reflect the nature of the long-seam welding process. The results were presented in tabular form.

The third milestone developed flow charts to implement the criteria developed in meeting the first two milestones, with these criteria being embedded in decision points within the information and decision flow. Three sets of flow charts each with similar purpose and level of complexity were needed. The high-level flow charts are simple and structured to ask and answer – is this vintage segment safe according to current integrity management practices? Negative answers lead to a second screening level that utilizes the thresholds exhibited by the various degradation mechanisms to determine if operation occurs below the threshold, indicating the threat is benign. At this second level, the flow charts are more complex, but still structured to ask and answer one question – is this vintage segment safe according to the way it is operated? Negative answers lead to a third screening level that explores options for integrity management in terms of the kinetics of the threat/degradation process and what practices exist to mitigate it.

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